WASTE STREAM 2F27 AGR Pond Sludge

SITE	Sellafield
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Sellafield Limited
WASTE TYPE	ILW
Is the waste subject to Scottish Policy:	No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	~6.6 m³
Future arisings -	1.4.2022 - 31.3.2023.....	0.2 m³
	1.4.2023 - 31.3.2024.....	0.2 m³
	1.4.2024 - 31.3.2025.....	0.2 m³
	1.4.2025 - 31.3.2026.....	0.2 m³
	1.4.2026 - 31.3.2027.....	0.2 m³
	1.4.2027 - 31.3.2028.....	0.2 m³
	1.4.2028 - 31.3.2029.....	0.2 m³
	1.4.2029 - 31.3.2030.....	0.2 m³
	1.4.2030 - 31.3.2031.....	0.2 m³
	1.4.2031 - 31.3.2032.....	0.2 m³
	1.4.2032 - 31.3.2033.....	0.2 m³
	1.4.2033 - 31.3.2034.....	0.2 m³
	1.4.2034 - 31.3.2035.....	0.2 m³
	1.4.2035 - 31.3.2036.....	0.2 m³
	1.4.2036 - 31.3.2037.....	0.2 m³
	1.4.2037 - 31.3.2038.....	0.2 m³
	1.4.2038 - 31.3.2039.....	0.2 m³
	1.4.2039 - 31.3.2040.....	0.2 m³
	1.4.2040 - 31.3.2041.....	0.2 m³
	1.4.2041 - 31.3.2042.....	0.2 m³
Total future arisings:		3.6 m³
Total waste volume:		10.2 m³

Comment on volumes:	Arising is estimated at 0.18m3 per year. Volumes are after centrifuging of sludge.Upper and lower uncertainties on masses are both a factor of 1.5.			
Uncertainty factors on volumes:	Stock (upper):	x 1.5	Arisings (upper)	x 1.5
	Stock (lower):	x 0.67	Arisings (lower)	x 0.67

WASTE SOURCE The waste contains wind blown debris, algae (both alive and dead), guano, feathers and some objects inadvertently dropped in the pond.

PHYSICAL CHARACTERISTICS

General description:	Suspended solids. There are not expected to be any large items.
Physical components (%wt):	Constituents of centrifuged solids are algae (66%) and guano/sludge (34%).
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m³):	1.61
Comment on density:	Density after centrifuging.

CHEMICAL COMPOSITION

General description and components (%wt):	Chemical constituents are those present in dust, algae and guano etc. The waste includes sodium, manganese, carbon, nitrogen, iron, silicon, aluminium, sulphur, chlorine, phosphorus, potassium, tin, zinc, lead, copper, nickel.

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Chemical state: Alkali

Chemical form of radionuclides: -

Metals and alloys (%wt): Metal only present as dispersed fines; no sheet or bulk metal.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel	P		
Other ferrous metals	P		
Iron			
Aluminium	P		
Beryllium			
Cobalt	0		
Copper	TR		
Lead	TR		
Magnox/Magnesium	TR		
Nickel			
Titanium			
Uranium			
Zinc	TR		
Zircaloy/Zirconium	0		
Other metals	0		

Organics (%wt): Cellulose only present in trace amounts from paper dropped into the pond. Perspex used in pond; some may be present. Rubber may be present. Neoprene 'O' rings possibly.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	TR		
Paper, cotton			
Wood			
Halogenated plastics	0		
Total non-halogenated plastics	TR		
Condensation polymers	0		
Others	TR		
Organic ion exchange materials	0		
Total rubber	TR		
Halogenated rubber	TR		
Non-halogenated rubber	TR		
Hydrocarbons			
Oil or grease			
Fuel			
Asphalt/Tarmac (cont.coal tar)			
Asphalt/Tarmac (no coal tar)			
Bitumen			
Others			
Other organics	TR		

Other materials (%wt): Wind blown sand dispersed throughout the sludge.

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	P		
Soil.....	P		
Brick/Stone/Rubble.....	TR		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....			
Graphite.....	0		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): Carbonates and nitrates are present. Chlorides, sulphates and sulphides are present as minor constituents. Phosphates are present in trace amounts.

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	P	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	P	
Nitrate.....	P	
Nitrite.....	NE	
Phosphate.....	TR	
Sulphate.....	P	
Sulphide.....	P	

Materials of interest for waste acceptance criteria: Waste is largely algae.

	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	>66.0	Algae (66%); guano.
Biodegradable materials.....	0	
Putrescible wastes.....	0	

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Non-putrescible wastes.....	
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	0
Higher activity particles.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances / non hazardous pollutants: Hydrocarbons are present in algae. Sulphur, lead, copper, nickel and possibly boron may be present in trace amounts.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....		
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....		
Molybdenum.....		
Thallium.....		
Tin.....		
Vanadium.....		
Mercury compounds.....		
Others.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

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Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids…….		
Other organic complexants.....		No complexing agents are present.
Total complexing agents.....	0	

Potential for the waste to contain discrete items: No. Waste itself not considered as a Discrete Item. This may change depending on the treatment, conditioning, and packaging.

PACKAGING AND CONDITIONING

Conditioning method: Strategy under development.

Plant Name: Not yet established.

Location: Sellafield.

Plant startup date: Not yet established.

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: -

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
Not specified	100.0	NE	NE	NE

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix:

Other information: -

Conditioned density (t/m³): NE

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

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RADIOACTIVITY

Source:	The main sources are Co-60, Cs-137, Cs-134, Mn-54 and Co-58.
Uncertainty:	Accuracy of activity is within a factor of 10.
Definition of total alpha and total beta/gamma:	Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.
Measurement of radioactivities:	-
Other information:	Activities are after centrifuging to remove water. Other alpha and other beta/gamma not yet determined.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	<1.48E-06	D 1	<4.74E-05	3	Pb 205				
Fe 55	1.18E-03	C D 1	1.06E-02	C D 2	Pb 210				
Co 60	9.38E-04	C D 1	3.72E-03	C D 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	6.87E-03	C D 1	7.47E-03	C D 2	Po 210				
Zn 65	<3.37E-06	D 1	<1.38E-04	3	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	5.57E-05	C D 1	7.40E-05	C D 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	<1.85E-05	D 1	<5.03E-04	3	U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237	<2.45E-04	D 1	<2.45E-04	3
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125	<1.82E-05	D 1	<1.62E-04	3	Pu 241				
Sb 126					Pu 242				
Te 125m	4.32E-06				Am 241	<9.13E-05	D 1	<9.31E-05	3
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	<1.90E-05	D 1	<2.41E-04	3	Cm 242				
Cs 135					Cm 243				
Cs 137	7.68E-03	C D 1	1.01E-02	C D 2	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	<4.24E-06	D 1	<1.49E-04	3	Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a	5.82E-04	C D 1	5.82E-04	C D 2
Eu 152					Other b/g				
Eu 154	<4.34E-05	D 1	<1.07E-04	3	**Total a**	**<9.18E-04**	**D 1**	**<9.20E-04**	**3**
Eu 155	<1.89E-05	D 1	<8.17E-05	3	**Total b/g**	**<1.68E-02**	**D 1**	**<3.34E-02**	**3**

Bands (Upper and Lower)

A a factor of 1.5
B a factor of 3
C a factor of 10
D a factor of 100
E a factor of 1000

Note: Bands quantify uncertainty in mean radioactivity.

Code

1 Measured activity
2 Derived activity (best estimate)
3 Derived activity (upper limit)
4 Not present
5 Present but not significant
6 Likely to be present but not assessed
7 Present in significant quantities but not determined
8 Not expected to be present in significant quantity